PATENT SPECIFICATION (11) 1 419 528

1 419 528

(21) Application No. 57909/72 (22) Filed 15 Dec. 1972 (19)

(31) Convention Application No. 7 147 384

(32) Filed 16 Dec. 1971 in

(33) Germany (DT)

(44) Complete Specification published 31 Dec. 1975

(51) INT. CL.[2] H01H 61/013

(52) Index at acceptance

H1N 25Y 262 280 282 296 60X 61X 700 701 747
G1D 12

(54) A DEVICE FOR MONITORING THE HEATING OF HEATER PLUGS OF AN INTERNAL COMBUSTION ENGINE

(71) We, ROBERT BOSCH GMBH., a German Company, of Postfach 50, 7 Stuttgart 1, Germany, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

The present invention relates to a device for monitoring the heating of heater plugs of an internal combustion engine.

Monitoring devices are known employing a nickel plated bimetal strip acting as a switching member, the distance between a contact on the bimetal strip and a countercontact being only about 0.2 mm if short pre-heating periods are to be indicated by the monitoring device. The correct adjustment of such small contact gaps involves considerable manufacturing difficulties and expense, since accurate and sensitive apparatus is required for this purpose and the accuracy of adjustment is affected markedly by fluctuations in temperature in the room where the monitoring devices are adjusted.

It is an object of the present invention to provide a monitoring device in which the contacts can be adjusted in a simpler and less expensive manner.

In accordance with the present invention there is provided a device for monitoring the heating of heater plugs of an internal combustion engine which comprises a hot wire secured to and electrically insulated from a base plate, the hot wire carrying at least part of the heating current to the heater plugs, an electrical indicating circuit including a bimetal strip heated by thermal radiation from the hot wire which actuates indicating means after a delay which is approximately equal to the required pre-heating period of the heater plugs, the bimetal strip having a surface which has an absorption factor for thermal radiation which is greater than 60%.

The conventional nickel coating which is used on the bimetal strips of known monitoring devices serves as a protection against corrosion, but has the disadvantage of having only a low absorption factor for thermal radiation. Compared with a "block body", nickel absorbs only about 7% of the thermal radiation which it encounters. On the other hand, a coating of, for example, matt black varnish, absorbs more than 90% of the thermal radiation it encounters. Thus, the same quantity of electrical energy fed to the hot wire of the monitoring device including the bimetal strip having a coating of matt black varnish causes the bimetal strip to be deflected to a substantially greater degree. It is thus possible for the distance between the movable contact on the bimetal strip and a countercontact to be considerably larger than would be the case with a nickel-plated bimetal strip, thus rendering it a simple matter to adjust the monitoring device.

In addition to the possibility of using materials having different absorption factors for thermal radiation for the purpose of varying the sensitivity of response and the sensitivity of adjustment of monitoring devices, it is also possible for only one side of the bimetal strip to have a surface having an absorption factor for thermal radiation which is greater than 60%. Preferably, the surface having an absorption factor for thermal radiation which exceeds 60% is disposed on that side of the bimetal strip which is made from the material having the lower coefficient of thermal expansion.

The monitoring device of the present invention may have its switching time adjusted by bending the hot wire towards the bimetal strip.

A preferred embodiment of the present invention will hereinafter be described with reference to the accompanying drawings, in which:—

Fig. 1 shows a side elevation of a monitoring device,

Fig. 2 shows a plan view of the monitoring device of Fig. 1, and

Fig. 3 shows a circuit diagram of the monitoring device of Figs. 1 and 2.

A monitoring device 10 includes a hot wire helix 11 surrounding a bimetal strip 12 which acts as a switching element. Rectilinearly extending ends 13 and 14 of the hot wire helix 11 are secured to a metal base plate 15 but are electrically insulated therefrom. The bimetal strip 12 extends substantially axially of the helix 12 and the heating current for heater plugs 26 (Fig. 3) flows therethrough. One of the ends of the bimetal strip 12 carries a plug contact 27, and the other end carries a switching contact 16 which cooperates with a fixed contact 17 of a contact carrier 18. The bimetal strip 12 is so constructed that the contact 16 is deflected towards the fixed contact 17 when the temperature of the bimetal strip 12 increases, and in the opposite direction when the temperature decreases. A matt black layer 28 of varnish having an absorption factor for thermal radiation which is greater than 60%, is applied to the side of the bimetal strip 12 facing the fixed contact 17.

The free end of the contact carrier 18 forms a plug contact 19 to which a pilot lamp 20 (Fig. 3) is connected. The bimetal strip 12 and the contact carrier 18 are secured to two insulating members 21 and 22 respectively which are located at the two ends of the base plate 15. A sheet metal hood 23 is welded to the base plate 15 so as to cover the portions of the strip 12 and the contact carrier 18 between the members 21 and 22, together with the helix 11. The base plate 15 is provided with flanges 25 in which holes 24 are provided. The monitoring device 10 may then be secured in a motor vehicle by way of the holes 24.

When the monitoring device 10 has been switched on, a current flows from the positive pole of a battery (not illustrated) to earth by way of the hot wire helix 11 and four heater plugs 26. The hot wire helix 11 is thus heated and the radiated heat acts upon the bimetal strip 12 which is provided with the varnish layer 28. After a pre-heating period, the contact 16 moves towards, and makes contact with, the fixed contact 17 on the contact carrier 18. Part of the battery current now flows through the bimetal strip 12 and the contact carrier 18 to the pilot lamp 20 which is connected to earth and which therefore is connected to earth and which therefore lights up. The lighting of lamp 20 indicates that the temperature required for starting the internal combustion engine has been attained.

Instead of applying a matt black varnish layer to one side of the bimetal strip 12, different materials having an absorption factor for thermal radiation which is greater than 60% may be applied to either one side or both sides of the bimetal strip according to the contact closing times required.

WHAT WE CLAIM IS:—

1. A device for monitoring the heating of heater plugs of an internal combustion engine comprising a hot wire secured to and electrically insulated from a base plate, the hot wire carrying at least part of the heating curent to the heater plugs, an electrical indicating circuit including a bimetal strip heated by thermal radiation from the hot wire which actuates indicating means after a delay which is approximately equal to the required pre-heating period of the heater plugs, the bimetal strip having a surface which has an absorption factor for thermal radiation which is greater than 60%.

2. A device as claimed in claim 1, wherein only one side of the bimetal strip has a surface which has an absorption factor for thermal radiation which is greater than 60%.

3. A device as claimed in claim 2, wherein the bimetal strip has a surface having an absorption factor for thermal radiation which is greater than 60% only on that side of the bimetal strip which is made from material having the lower coefficient of thermal expansion.

4. A device as claimed in any preceding claim, wherein the bimetal strip is eccentrically surrounded by the hot wire.

5. A device as claimed in any preceding claim, wherein the bimetal strip has a matt black coating forming the surface having an absorption factor for thermal radiation which is greater than 60%.

6. A device as claimed in claim 5, wherein said matt black coating is a layer of varnish.

7. A device for monitoring the heating of heater plugs of an internal combustion engine constructed and adapted to operate substantially as hereinbefore described with reference to and as illustrated in the accompanying drawings.

W. P. THOMPSON & CO.,
12 Church Street,
Liverpool, L1 3AB.
Chartered Patent Agents,

Reference has been directed in pursuance of Section 9, subsection (1) of the Patents Act 1949, to Patent Nos. 1,186,104 and 1,169,477.

Printed for Her Majesty's Stationery Office by Burgess & Son (Abingdon), Ltd.—1975
Published at The Patent Office, 25 Southampton Buildings, London, WC2A 1AY
from which copies may be obtained.

1419528 COMPLETE SPECIFICATION
1. SHEET *This drawing is a reproduction of the Original on a reduced scale*

Fig. 1

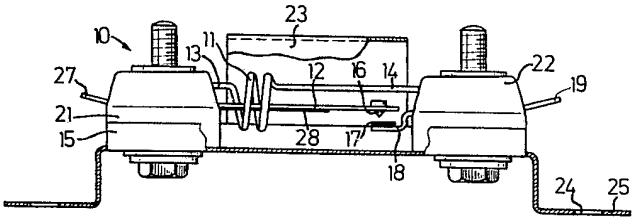


Fig. 2

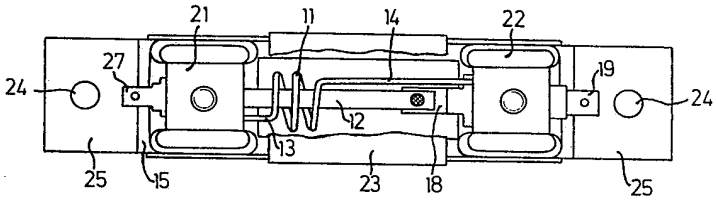
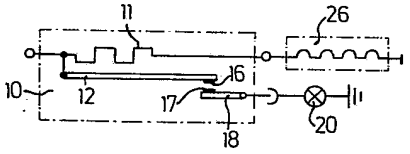


Fig. 3



DERWENT-ACC-NO: 1976-A1294X

DERWENT-WEEK: 197601

TITLE: Internal combustion engine heater plug monitor has hot wire helix surrounding bimetal strip carrying heating current

PATENT-ASSIGNEE: BOSCH GMBH ROBERT[BOSC]

PRIORITY-DATA: 1971DE-047384 (December 16, 1971)

PATENT-FAMILY:

PUB-NO	PUB-DATE	LANGUAGE
GB 1419528 A	December 31, 1975	EN

INT-CL-CURRENT:

TYPE	IPC DATE
CIPS	F02P19/00 20060101

ABSTRACTED-PUB-NO: GB 1419528 A

BASIC-ABSTRACT:

The device (10) for monitoring the heater plugs of an i.e. engine includes a hot wire helix (11) secured to and insulated from a base plate (15). The wire surrounds a bimetal strip (12) which

acts-as a switching element and which carries the heating current for the plugs. The bimetal strip is constructed so that the contact (16) it carries is deflected towards a fixed contact (17) when the strip temperature increases. A matt black layer (28) of varnish with an absorption factor greater than 60% for thermal radiation is applied to the side of the strip facing the fixed contact. When the device is switched on current flows to earth through the hot wire and four heater plugs. After a pre-heating period the contact (16) contacts the fixed contact (17).

TITLE-TERMS: INTERNAL COMBUST ENGINE HEATER PLUG MONITOR HOT WIRE HELIX SURROUND BIMETAL STRIP CARRY HEAT CURRENT

DERWENT-CLASS: V03